UNIVERSITI PUTRA MALAYSIA

THE ECONOMICS OF CENTRAL LUZON DRY SEASON IRRIGATION SCHEME

Gaspar Britania Bimbao

It is hereby certified that we have read this thesis entitled "The Economics of Central Luzon Dry Season Irrigation Scheme" by Gaspar Britania Bimbao, and in our opinion it is satisfactory in terms of scope, quality and presentation as partial fulfilment of the requirements of the degree of Master of Science.

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July 1984

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A thesis
submitted in partial fulfillment
of the requirements for the Degree of
Master of Science (Resource Economics) in the
Universiti Pertanian Malaysia

1984

ACKNOWLEDGEMENTS

The author acknowledges with profound appreciation and sincere gratitude the kind assistance rendered by the following persons and institutions:-

UNIVESITI PERTANIAN MALAYSIA:

Dr. Mohd. Ariff bin Hussein

Prof. Eric T. Gibbons

Dr. Mohd. Ghazali bin Mohayiddin

Dr. Syed Hamid Syed Aljunid

Prof. Ahmad Mahdzan Ayob

Dr. Mat Yusoff bin Abdullah

AGRICULTURAL DEVELOPMENT COUNCIL, INC.:

Mr. Gerard Rixhon and Staff

CENTRAL PHILIPPINE UNIVERSITY:

Prof. Enrique S. Altis

Mr. Ricardo Patricio

Dr. Agustin A. Pulido

Mr. Ernesto Elefan

INTERNATIONAL RICE RESEARCH INSTITUTE:

Dr. Robert W. Herdt

Mr. Domingo F. Tabbal

Mr. Geronimo Dozina, Jr.

Ms. Linda Bantillan-Gloria

Dr. Sadiqul I. Bhuiyan

Ms. Mariquita Lopez-Sipin

Ms. Leila Herbano

Ms. Peidad Moya

National Irrigation Administration:

Engr. Ernesto Frayna and Staff

UNIVERSITY OF THE PHILIPPINES AT LOS BANOS:

Dr. Tirso Paris

Dr. Gerald Nelson

CDEM Librarian and Staff

All views expressed and any errors of factual interpretations are those of the author. Apology is offered to anyone whom the author may have inadvertently omitted.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Abstract of thesis presented to the Senate of Universiti Pertanian Malaysia in partial fulfillment of the requirements for the Degree of Master of Science

THE ECONOMICS OF CENTRAL LUZON DRY SEASON IRRIGATION SCHEME

By

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July, 1984

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This study was undertaken to evaluate the impact of Camiling River Irrigation System (CamRIS) in Central Luzon, Philippines on the total dry season paddy production, the resource use efficiency, the level and distribution of paddy incomes; and to examine the factors which determined the extent of paddy cultivation by farmers under the scheme.

Results of the study revealed that the mean area cultivated and yield per hectare increased significantly under the scheme, hence, the total area planted, production and cropping intensity. Nevertheless, the scheme failed to reduce the variability of these factors among the various sections of CamRIS.

Farmers considered seeds, hired labour and total labour among other inputs of utmost importance in attaining higher paddy production under the scheme as only in these inputs that expenditure per hectare significantly increased. Nevertheless, the paddy net income before and after the scheme were not significantly different. In addition, the scheme failed to reduce income inequality among the farmer-participants as depicted by their almost identical Lorenz

curves before and after the scheme and corroborated by the equal values of their Gini coefficients of 0.47.

Resource use efficiency analysis revealed that expenditures on seeds and family labour were adjusted to their optimum values after the scheme. In contrast to fertilizers which were allocated efficiently before and after the scheme, expenditure allocations on chemical inputs for crop protection and hired labour were inefficient as indicated by their ratios of marginal value products to factor costs which were significantly less than unity. Thus, reducing the allocation of these inputs would have increased their production efficiencies.

Regression analysis showed that the profitability of dry season irrigated farming and the availability of family and hired labour were the major determinants the in farmers' decision to increase paddy cultivation under the scheme. On the other hand, working capital carried forward from the wet season, tenure status, non-mechanisation of land preparation were factors that worked against the farmers to increase their paddy cultivation.

Abstrak tesis yang diserahkan kepada Senat Universiti Pertanian Malaysia sebagai memenuhi sebahagian dari syarat untuk keperluan ijazah Sains Master

EKONOMI SKIM PENGAIRAN MUSIM KERING DI LUZON TENGAH

Oleh

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Kajian ini dibuat untuk menilai kesan Sistem Pengairan Sungai Camiling (CamRIS) ke atas jumlah pengeluaran padi musim kering, kecekapan penggunaan dan aras serta pengagihan pendapatan padi di Luzon Tengah, Filipina. Faktor-faktor yang menentukan sejauh manakah penanaman padi dijalankan oleh petani-petani di bawah skim itu juga diselidik dalam kajian ini.

Keputusan yang diperolehi daripada kajian ini menunjukkan min kawasan yang ditanan dan hasil sehektar menambah secara bererti di bawah skim itu. Ini bermakna berlakunya penambahan jumlah kawasan penanaman, pengeluaran dan juga intensiti penghasilan. Walaubagaimanapun, skim itu juga gagal mengurangkan variabiliti berkenaan dengan faktor-faktor yang tersebut di atas di beberapa kawasan CamRIS.

Petani-petani menganggap input-input seperti biji-biji benih, buruh upahan dan jumlah buruh adalah di antara yang paling mustahak untuk mencapai pengeluaran padi yang lebih tinggi di bawah skim itu sebab perbelanjaan sehektar telah meningkat secara bererti untuk input-input ini sahaja. Walaupun sedemikian, pendapatan bersih padi sebelum dan selepas skim itu tidak memberi perbezaan yang bererti.

Tambahan pula, skim itu gagal mengurangkan ketidaksamaan pendapatan di kalangan petani-petani yang mengambil bahagian di bawah skim itu. Ini boleh ditunjukkan oleh keluk-keluk Lorenz yang hampir sama sebelum dan selepas skim itu serta nilai-nilai koefisyen Gini yang sama, iaitu, 0.47.

Analisis kecekapan penggunaan sumber menunjukkan bahawa perbelanjaan- perbelanjaan ke atas biji-biji benih dan buruh keluarga telah diubahsuaikan untuk mencapai nilai optimum selepas skim itu. Pertentangan dengan baja-baja yang telah diperuntukkan, perbelanjaan ke atas input-input kimia untuk pemeliharaan tanaman dan buruh upahan adalah tidak cekap. Ini telah ditunjukkan secara bererti oleh nisbah-nisbah nilai keluaran sut dengan kos-kos faktor yang kurang daripada satu. Oleh yang demikian, pengurangan dalam peruntukan input-input ini mungkin akan meningkatkan kecekapan pengeluaran mereka.

Analisis regresi pula menunjukkan bahawa keberuntungan penanaman dengan cara pengairan musim kering dan buruh upahan serta buruh keluarga yang sedia ada merupakan perkara-perkara yang penting bagi pihak petani-petani untuk menentukan penambahan penanaman padi di bawah skim itu. Disebaliknya, modal kerja yang dibawa dari musim basah, taraf hakmilik tanah serta persiapan tanah tanpa bantuan jentera adalah faktor-faktor yang menghalang petani-petani dalam usaha mereka untuk menambahkan penanaman padi.

CHAPTER I
INTRODUCTION

The Philippines (Figure 1), like many other countries in South and South-East Asia, considers irrigation to be a key factor in attaining self-sufficiency in food grains. Irrigation in the country can be classified into three major categories: (1) national gravity, (2) communal gravity, and (3) pump. A total of 919,461 hectares were irrigated by the systems; 37 per cent by national systems; 47 per cent by communal, and 16 per cent by pump systems in 1978 (Moya et al., 1980). About 67 per cent (5.2 million metric tonnes) of the total paddy production (7.7 million metric tonnes) is produced under irrigation.

Massive investments have been made in irrigation development in the country. The total investment for the 1978-87 is expected to be P14.34 billion (U.S. $1.91 billion). An additional, P6.05 billion (U.S. $0.81 billion) is due to be invested during the 1988-2000. At the above rates, the average cost per hectare irrigated annually is P10,315 (U.S. $1,375) for the 1978-87 and P15,370 (U.S. $2,409) over the 1988-2000 period (Capule, 1980).

Although considerable investment has been committed to infrastructural development and other management programmes, the problem of achieving equitable and efficient irrigation performance remains. In most gravity irrigation systems in the Philippines, irrigation water is allocated and distributed to different irrigation blocks through the continuous method with minimal control from the source. Water is thus supplied simultaneously to all fields of a

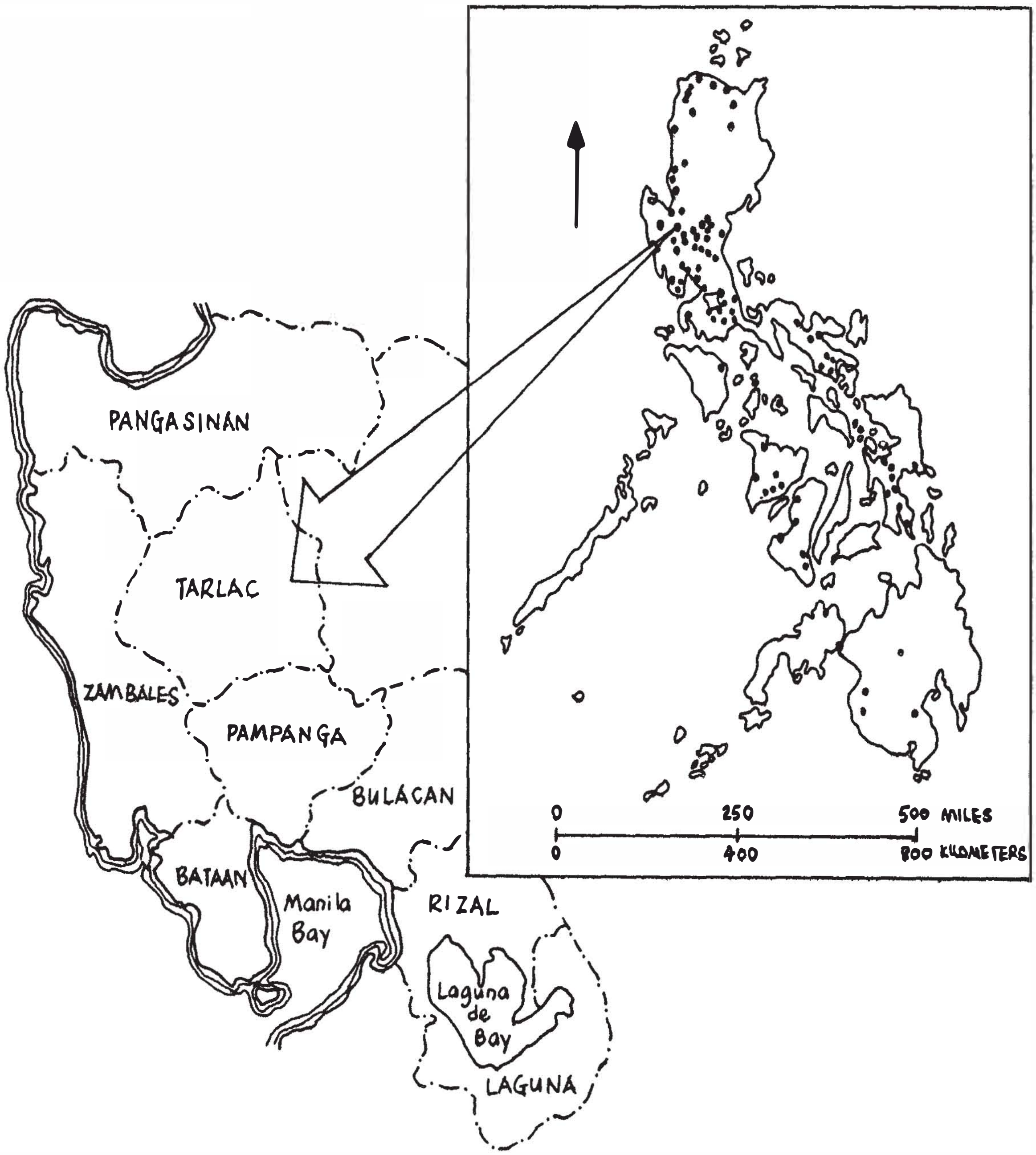

Figure 1. Distribution of Irrigation Schemes in the Philippines and the Study Area

particular system.

Four important consequences can arise from this method of water allocation and distribution (Wickham, 1971; Tabbal and Wickham, 1976; Valera and Wickham, 1976; Moya and Early, 1981). Firstly, inequitable and inefficient distribution of water occurs along the length of the supply canal. Over-irrigation is usually experienced in the upper reaches and under-irrigation in the lower reaches. The problem of inequitable distribution in most gravity systems in the Philippines is associated with the irrigation structures needed for water control and effective distribution. Canals are usually heavily silted and overgrown with thick vegetation, embankments are constructed below standard and the structure outlets are seriously eroded. Outlet channels (turnouts) are mostly ungated and they have no control over measuring devices. Farm irrigation and drainage ditches for the movement of the optimal volume of water to the farm plots at the proper time, are generally insufficient and very often are absent (Miranda, 1975). Consequently, there is a delay of up to 30 days between the date when water is first released until the time it reaches the last farm plot (Early et al., 1978). As the distance involved varies between 5 kilometres to 20 kilometres, the last factor mentioned is critical from such standpoints as evaporation and schistosomiasis.

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1. Schistosomiasis (Bilharzia) is a very serious disease for human beings in some parts of the Philippines which is transmitted by water-borne snails. The snails multiply when host waters are warm and slow moving. The disease is easily obtained from drinking or even washing or bathing in slow-moving water with carrier snails.

Secondly, farmers in the lower reaches interfere in the operation and management to seize illicitly what they consider to be their water share. They do this by checking canal flows, breaking embankments, closing and opening turnout gates at will, and tampering with devices such as the check structure and diversion boxes. These behaviours are found to be positively associated with the distance from the water source (Moya and Early, 1980). Farmers most distant from the source usually engage in these activities because they want to obtain sufficient water in the shortest possible time. There is little evidence of official control and coordination of water supply scheme or part of the conveyance network and other aspect of the system, especially under conditions of water shortage.

Thirdly, as flood control is not practised in most systems in the country, paddy yield per hectare attained by farmer-participants are less than the potential, frequently by as much as 30 to 60 per cent.

Fourthly, most systems operate at low irrigation efficiency, being far less than the efficiency in a surface irrigation. In general, on-farm water-use efficiencies range from 30 to 38 per cent even in areas with adequate supply. About 62 per cent of the total water supply during the wet season and 32 per cent in the dry season are wasted as surface drainage (Wickham, 1971).

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2. Water-use efficiency is defined as crop yield per unit of water use (Stewart, 1979).

The above problems of water allocation and distribution have been well-documented and evidence shows that the efficiencies of water utilisation can be improved substantially with better management of the system (Greenland and Bhuiyan, 1980). Greater water-use efficiency will result in both higher and more stable yields per hectare on previously cropped area, an increase in the cropped area under paddy production, or both over the system. The increase in yield is made possible either because of reduced water stress days, increased use of complementary inputs e.g., fertilizer, or better timeliness of planting and other cultivations. An improved system of management means more water would be available to farmers to expand their land cultivation (Small et al., 1980). Improvement in management are also likely to reduce the variability in yields among the different blocks of the system, thereby spreading the benefits of irrigation less unequally among the farmers concerned.

In an attempt to alleviate the above problems and to improve the management of gravity systems, two joint projects were initiated by the National Irrigation Administration (NIA) and the International Rice Research Institute (IRRI) in 1978. The general purposes of

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3. Water stress days are defined as the number of days a field or observation paddy is not flooded or without standing water. A standard practice is to exclude 2-3 days when a field without water in counting the number of stress days.

4. Gravity system usually include an obstructing barrage on the river to raise the elevation of water as well as diversion and canal networks to serve the low lying command area by gravity flow (Miranda, 1975). There are two types of gravity systems: (1) run-of-the-river and (2) reservoir. The former has low weir-type dam and unlike the latter has no means of water storage.

these projects were: (1) to increase knowledge about the requirements for improved water management, (2) to modify the management of the main systems in order to obtain better balance between water deliveries and water demands, and (3) to study and evaluate the results of the efforts to change the system management. One of the sites for the projects is the Camiling River Irrigation System (CamRIS), Tarlac, Central Luzon, Philippines, the area of this study.

The Problem

Improving irrigation management in CamRIS (Figure 2) involves determining the optimal location and timing of irrigation and then allocating and distributing the water to the target areas. The present scheme of allocation and distribution of irrigation supply in CamRIS raises acute problems of equity and productivity. Rural inequality which traditionally is associated with differing sizes of land holdings rather than accessibility of farm inputs such as irrigation water, does not necessarily hold true when a farmer with access to irrigation is able to crop his land at least twice a year than another farmer relying only on one irrigation. Given that the attainment of increased food production is a major objective, any remedial measures have to strike a balance between equity to individual small holder and the total productivity from the scheme as a whole.

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5. "Scheme" refers to improved dry season irrigation management in CamRIS.

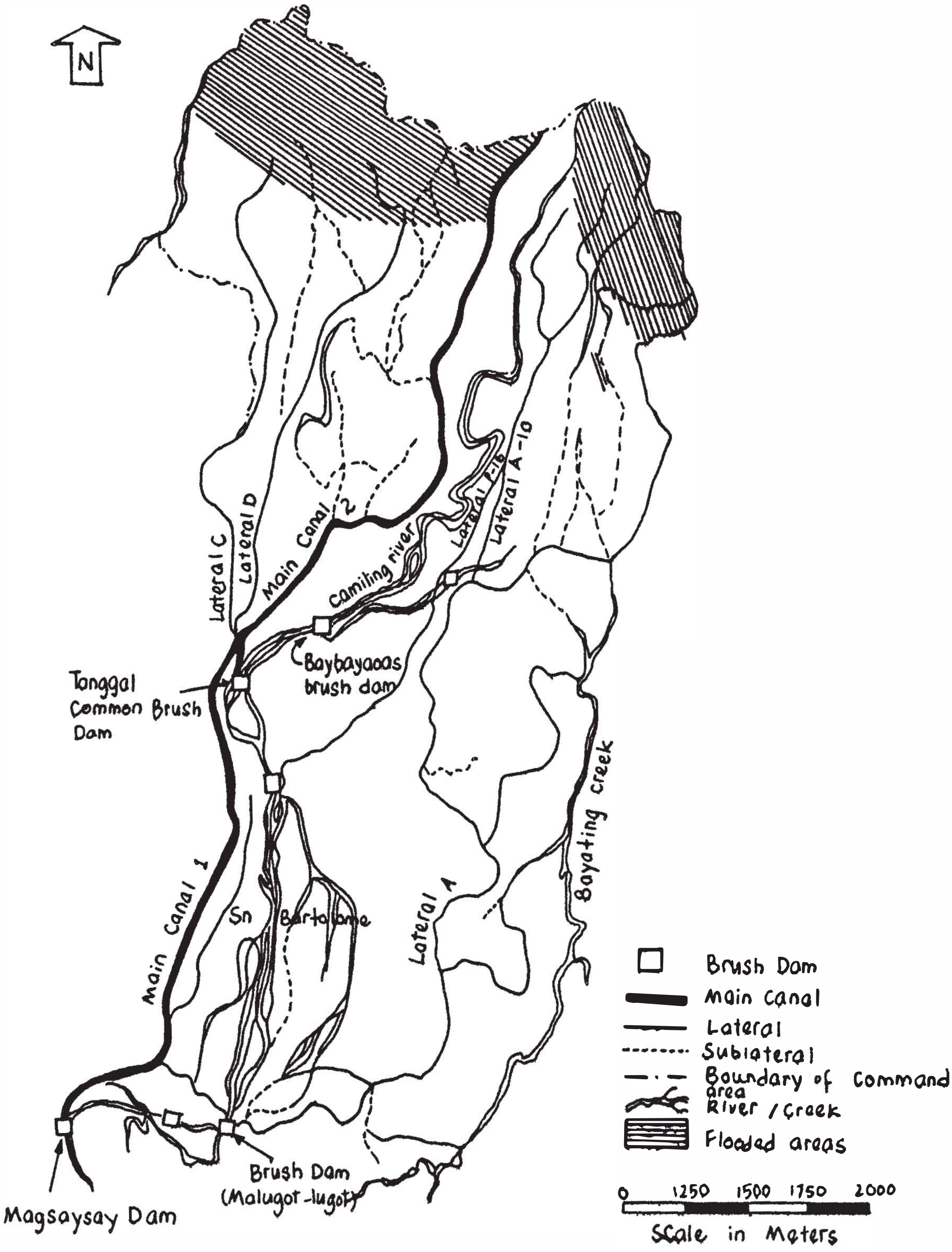

Figure 2. The Camiling River Irrigation System

Some pressing questions arise from the issues of equity and productivity resulting from the present allocation and distribution scheme in CamRIS. Firstly, will the scheme lead to higher paddy yield, production, area cultivated and cropping intensity? Secondly, will the scheme increase dry season input use for paddy production? Has it resulted in greater income from dry season paddy production in the whole system? Thirdly, will the scheme reduce income inequality among farmer-participants? Lastly, what are the limiting factors, both economic and non-economic, to the extent of paddy cultivation in dry season irrigated farming under the scheme?

The Objectives

The chief objectives of this study of CamRIS were to evaluate the scheme's impact on the level of production, productivity and efficiency of selected farm inputs; the level and distribution of farm incomes; and lastly, to examine the factors which determine the extent of paddy cultivation by farmers in dry season irrigated farming under the scheme.

The specific objectives were:

(1) to estimate the dry season's net increase (or decrease) in paddy yield per hectare of farmers and total paddy production in CamRIS after the scheme's inception;

(2) to calculate the dry season's net increase (or decrease) in mean area planted with paddy, total area cultivated and cropping intensity of farmers in CamRIS after the scheme;